VA Office of Information and Technology
Office of Enterprise Architecture Management

Systems Integration and Development Service

Configuration Item Selection Guide
CM312

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Department of Veterans Affairs

System and Integration Service

Letter of Promulgation

As the Director of the System Development and Integration Service (SIDS) within the Office of Enterprise Architecture at the Department of Veterans Affairs (VA), Office of Information and Technology (OI&T), I do hereby formally promulgate this Configuration Management Configuration Item (CI) Selection Guide and approve its use for execution across the SIDS. This procedure provides direction and guidance to SIDS Program and Project personnel in the selection of CI for formal configuration management control.

(Signature obtained and on file) 5-24-06
Frances G. Parker, Director (Acting) (Date)
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Record of Changes

CCP #	CCP Date	Description of Change (or title)	Date Entered	Entered by: (initials)
N/A	N/A	Initial issue	5/24/06	bgl

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1. INTRODUCTION

This document has been prepared to address the Configuration Item Selection sub-section of Configuration Management Plans (CMP) within the System Integration and Development Service (SIDS) and as an aid to the SIDS Configuration Identification Procedure. This guide functions as direction and contains guidelines to assist stakeholders in determining items, components, and elements to be placed under formal configuration control.

1.1. PURPOSE

The purpose of this document is to provide criteria, and guidance for selecting CI for formal configuration control. Formal configuration control incorporates the establishment of baselines, the imposition of formal change management and change decision processes, the conduct of status accounting, and the oversight of auditing to ensure product integrity. The process of selecting configuration items requires the exercise of good management and systems engineering judgment, supported by cost trade-off considerations.

1.2. SCOPE

This procedure applies to all projects and systems within SIDS including the SIDS system of organizational management processes, plans, and procedures. Approval of a written Request for Waiver (RFW) to the Director, SIDS, is required for non-compliance with this procedure in whole or in part.

1.3. AUTHORITY

The Director, SIDS, is the issuing authority for this document and only the Director, SIDS, or higher authority may authorize it to be altered, superseded, or cancelled. Any changes or modifications to this document must be submitted for approval using the provisions of the SIDS Configuration Management Plan.

Any conflict between this document and higher authority will be resolved in favor of the higher authority. Anyone observing such a conflict is requested to bring it to the immediate attention of the Director, SIDS (or delegated SIDS authority).

1.4. CHANGE AND CANCELLATION

This is an original document and does not supersede a previous version or any other document.

1.5. REFERENCES

There are no official references for this document. It has been developed from a review of many examples in various organizations to create a consolidation of best practices.

1.6. TERMS AND ABBREVIATIONS

1.6.1. Terms and Definitions

Configuration Item – Any product, product component, or product element selected for and placed under formal configuration management and control.
Configuration Component – Refer to "configuration item."
Configuration Element – Refer to "configuration item."
Configuration Unit – Refer to "configuration item."

NOTE: Configuration items can be decomposed into configuration components, units, and elements. These terms are often relative to the level of product organization at which they are envisioned. For example, an airplane (configuration item) may be decomposed into components – body, wings, tail section, engines, electronics, etc.; however, the builder of the engines (his item) may decompose the engine into its components. Therefore, the term "configuration item" in this document refers to any item, component, unit, or element selected for and placed under formal configuration management and control.

1.6.2. Abbreviations

The following abbreviations are used in this procedure:

Abbrev.	Expansion
CI	Configuration Item
COTS	Commercial Off the Shelf
EAM	(Office of) Enterprise Architecture Management
OI&T	Office of Information and Technology
RFW	Request For Waiver (and Deviation)
SDLC	System Development Life Cycle
SIDS	System Integration and Development Service
VA	(U.S. Department of) Veterans Affairs

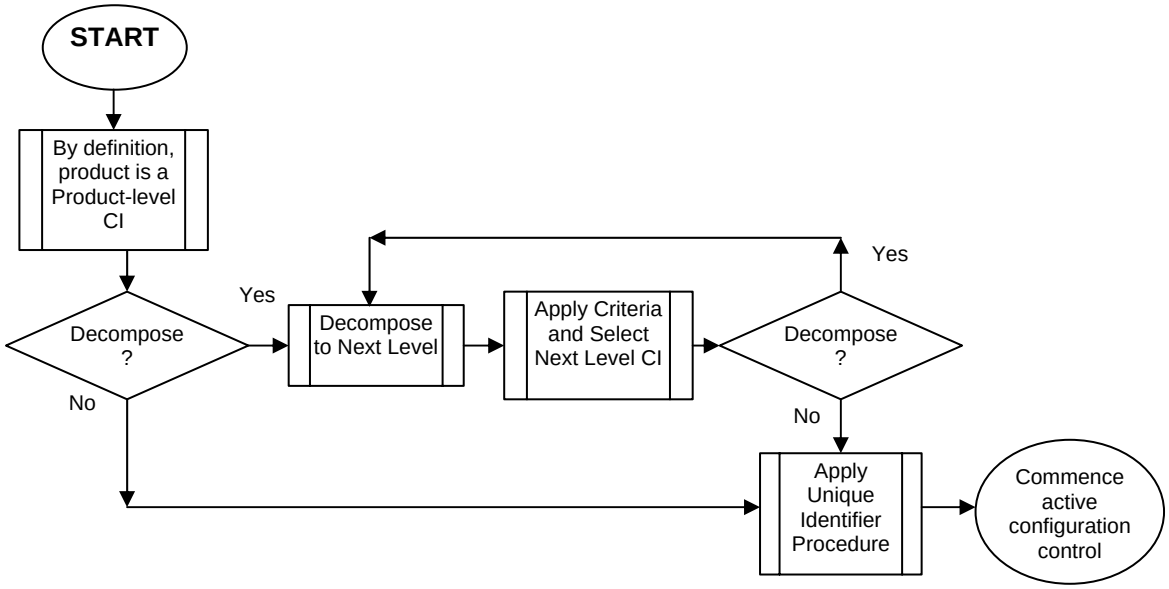
1.7. ASSUMPTIONS

The selection of CIs assumes the following activities will occur as part of the Configuration Identification Selection Process:

- Selection of CIs at appropriate levels of breakdown within the product structure,
- Determination of the type of documentation required for each CI to ensure an accurate description of its physical and functional characteristics, emphasizing internal and external interfaces,
- Formation of a CI tracking/numbering and labeling systems,
- Nomination by a corresponding sponsor of each CI in keeping with the maintenance and logistic infrastructure of the organization or group, and
- An SDLC is in place with corresponding baselines established through technical and management reviews.

2. PROCESS DIAGRAM

Below are two variations of the CI Identification process. The "selection" process, i.e., decomposition and criteria application, is shown within the identification process for context. For smaller, more simplistic products, perform item decomposition and selection before applying unique identifiers. For larger, more complex products (relatively few CI can be determined up front), use an iterative process of decomposition and selection as the project progresses.



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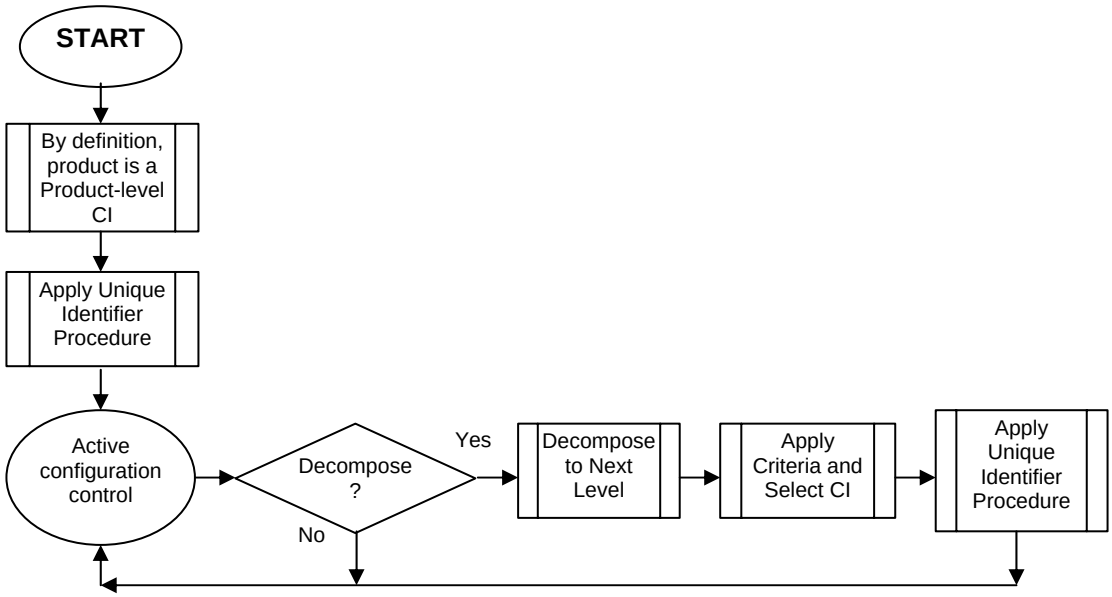

3. GUIDANCE

Selecting CIs comprises three iterative steps in the configuration identification process: (1) begin with the initial item (project), (2) determine if it should be placed under configuration control; if so and if possible, (3) decompose the item into its components. This same sequence should be applied to the components resulting from the decomposition. This analyze-decompose-analyze cycle should continue until it is determined that the criteria are no longer being met or until constrained by external factors.

3.1. SELECTING CONFIGURATION ITEMS

Selection and identification of specific CIs should be conducted as early as possible in the product life cycle; however, it is necessary to remember that additional CIs may and probably will be added as the product evolves. Purposes of the configuration selection process include:

- To determine the structure (hierarchy) of a product in terms of the organization and relationships of its parts, its configuration documentation, and other product information,
- To identify an appropriate degree of configuration control for items, components and elements based on functionality, verifiability, supportability, complexity, and risk, and
- To provide references for defining changes and corrective actions.

CI selection requires careful technical, logistical, and administrative evaluation. Designation as a CI increases visibility and control of the selected item throughout its life cycle. CI selection must be carried out with a view to the requirement for and cost of that control.

3.2. ASSUMPTIONS

The selection of CIs assumes the following activities will occur as part of the Configuration Identification Selection Process:

- The type of documentation required for each CI ensures an accurate description of the items physical and functional characteristics, including internal and external interfaces,
- Each CI is nominated by a corresponding sponsor in keeping with the maintenance and logistic infrastructure of the organization or group,
- Not all items require selection as CI for formal control, and
- Not all selected items require the same level or degree of formal control.

3.3. CONFIGURATION SELECTION PROCESS.

The Project CMP will state any CIs that have already been identified (specific CI or at a conceptual or functional level), and provide detailed plans as to how CIs will be chosen, numbered, documented and tracked. This section is usually split into two sub-sections, and the information to be covered includes:

- **Conduct of CI selection**. The physical selection of CIs is usually conducted by the application or systems development team, followed by the approval of the appropriate levels of CCB. The detail to be documented includes:

(a) Who will identify the CIs (usually a committee), and when;
(b) Criteria for the CI selection process; and
(c) How and when CIs will progress from functional identification (Functional Baseline) to an allocated design identification (Allocated Baseline) and/or production design identification (Product Baseline).

- **Documentation of CIs.** Once selected, a CI must be fully documented to a level that supports the intended repair, re-supply and control levels for the project and in-service phases. That level will be achieved in an evolutionary manner as the design is refined and the project progresses to the production stage.

3.4. CONFIGURATION ITEM GRANULARITY

"Granularity" refers to the depth of detail to which a prospective CI is decomposed. In theory, each rivet in an airplane or each line of code in a software program can be placed under individual configuration control. This section discusses some of the pro's and con's of selecting a given level of granularity.

3.4.1. Fine Granularity

Selecting CIs at too fine a level of granularity can increase development and support costs by increasing the number of CIs and the resulting increase in labor costs for management. Also, too many CIs at too fine a level of detail may inhibit management visibility and require a cost-prohibitive level of effort for control.

Each CI to be developed comes with an associated set of technical reviews, audits, performance or design verification demonstrations, formal unit and integration tests, and documentation requirements. Each of these activities, usually required and scheduled in the relevant project management plan, adds an increment of development cost as well as the storage and upkeep cost of information related to the activities and the documentation.

Additionally, as the number of CIs increases, the number of interfaces between CIs usually increases. Too many of these selected and defined too early can hamper the evolution of design solutions, hinder speedy problem solving, and inhibit implementation of advantageous changes.

3.4.2. Course Granularity

A course level of granularity for CI yields fewer, more complex CIs; however, there are several risk subjects to be considered. A high degree of complexity (such as combining unrelated functions, functions containing both hardware and software components, etc.) of a CI:

- Decreases management insight into its development and the ability to the assess progress of the item,
- Decreases the potential for reuse of the CI, or portions of the CI,
- Complicates re-procurement of the CI and components,
- Limits potential re-procurement sources,
- Can delay formal testing of critical capabilities (or make testing more difficult),

- Disables the ability to account for the deployment of a CI when component parts are deployed to different locations, and
- Increase the complexity and cost of managing and accounting for common assemblies and components (i.e., costly logistics and maintenance difficulties).

3.5. MANDATORY CI

As stated in the SIDS Configuration Management plan, all projects and systems within SIDS, including the SIDS system of organizational management processes, plans, and procedures are CI. There are no mandatory CI below that level; however, there are some near-mandatory CI situations. Further, SIDS management may dictate finer levels of granularity or detail for a project. Near-mandatory criteria include:

- **Complex systems.** Each major sub-system (e.g., database system, software application system, communication system, etc.,) should be selected as a CI, with varying levels of CIs below it. Each CI may have its own specification, and may also require a separate CM process, manager and Configuration Change Management Board.
- **Database Content.** Static content should be selected as a CI. Static content is that which is changed infrequently. For static content, additional considerations are criticality to the system and its importance to other factors including external factors.
- **Maintenance data.** If data is to be gathered on the performance of a component (i.e. Reliability, Availability and Maintainability (RAM) data), the component should be identified as a CI to ensure validity of the collected data.
- **Software.** Software (and firmware) packages must always be selected as CI at the "package" level, so that complete version control is maintained. A software "package" is that grouping of product components passed to the users. For example, the software, user's manual and installation manual are usually the contents of a software package on the store shelf, and the software, test scripts and test data constitute a test package.
- **Requirements Statement.** If a particular physical or functional requirement is stated in the contract, then it is beneficial if the system or component contributing to the fulfillment of that requirement is selected as a CI.
- **Interfaces.** Any assembly interfacing with external equipment must be selected as a CI.
- **Unique items.** Items unique to a particular variant (as opposed to a variant of a standard item), should be considered for identification as CI. If control of the specific functional or physical characteristics of any assembly or sub-assembly is required to ensure interface capability, then that assembly or sub-assembly must be selected as a CI. Additionally, if a sub-component within the assembly or sub-assembly must be individually managed for fit, form or function, then the assembly or sub-assembly must be further broken down and more CIs selected. However, not every subcomponent of the parent CI must be selected as a lower level CI, as management of their configuration may occur via their relationship to the higher-level CIs.

Some criteria for CI selection to formal configuration control are clearly quantitative. In many cases, quantitative criteria are accompanied by a stated threshold of authority, e.g., cost estimate exceeding a specified number of dollars; but in other cases, an accumulation of several small factors may dictate control. Further, qualitative factors often must be considered, and thresholds for qualitative criteria may be difficult to establish. The guidelines presented herein are intended

to help the system development or project manager select items and components for positive configuration control.

3.6. CI CRITERIA

Certain criteria must be considered when selecting CI. Some of the criteria may have thresholds and these thresholds may be universal in the VA organization, the OI&T organization, or the SIDS organization or may be dictated on a project basis. The areas of criteria are:

CRITICALITY and **SAFETY** – "Criticality" refers to the degree to which the product or its performance is endangered. "Safety" refers to the degree to which personnel, equipment, or facilities are in jeopardy.

MANDATE or DIRECTION – Higher authority may direct selection of CI based on criteria or thresholds at their level.

END-USE FUNCTION – "End-use function" is a relative term. A software product has an end-use function in the operating world, but a design drawing also has an end-use function as the basis for development of the product.

NEW or MODIFIED DESIGN – It may be necessary to apply formal configuration control to such an item in order to track "cause and effect" results.

TECHNICAL COMPLEXITY – Technical complexity creates a higher likelihood that something will be omitted or erroneously placed. Factors of complexity include new or modified designs, use of new materials or processes, and the degree to which the VA requires direct control over the item's performance requirements.

TECHNICAL RISK – Technical risk often is a result of technical complexity which increases the criticality of each element of the product.

DELIVERY SCHEDULE – Other elements may depend on a CI for delivery of the product. Also, for products that are to be delivered and implemented incrementally, it will be necessary to maintain track of the parts deployed and the parts to be deployed.

MULTIPLE-USE POTENTIAL – An item may have potential for use within another product or within a variation of the same product, which necessitates configuration control of the product description information. For example, a portion of a database design may be used in another database or a software sub-routine to be modified for use on another operating system.

SECURITY – An item may have an associated risk of unauthorized access to information or a risk of information/data loss due to instability.

3.7. EXTERNAL CONSIDERATIONS FOR CI

External considerations are those related to resources needed to creating and maintain the product or are indirectly related to a part of product or item under review. These considerations include factors such as:

- Number of people involved and their organization structure,
- Geographic dispersal of the workforce,
- Cost of the project,
- Amount of expected project data, and
- Length of the product life-cycle from project initiation through product retirement.

3.8. CI SELECTION GUIDELINES

The following guidelines are intended to assist in the selection of items for formal configuration control. Items that should be treated as CIs include:

CRITICALITY and **SAFETY**

- **Criticality and safety** If a component or assembly is critical to the safe use or mission success of the materiel, selection as a CI is mandatory. Selection will enable close monitoring of the component's functional performance, and strict control over product quality. Tracking and maintenance records of the development or modification of potentially dangerous products is extremely important to ensure faithful adherence to requirements, specifications, and designs. Further, in the event of an unwanted result, such records may provide an invaluable input for determining the cause.

DELIVERY SCHEDULE

- **Schedule/**Phasing. Elements scheduled for development, testing, and delivery at different times should be allocated to separate CIs.

END-USE FUNCTION

- **Documentation**. All documentation recognized and controlled as a component part of any baseline shall be selected as CI.
- **General purpose elements**. Elements that are general purpose in nature, that require the capability to be operationally reprogrammed, that are intended for reuse in other systems, or that are likely to be changed after initial deployment may be classified as separate CIs.

MANDATE or DIRECTION

- Projects and supervisors will be notified by appropriate communication of items, components, and elements mandated or directed to be CI.

MULTIPLE-USE POTENTIAL

- **Common subsystems/equipment**. Assembly parts of a subsystem or support equipment that is common to multiple systems shall be selected as CIs. An assembly part required as an interface within or to meet requirements peculiar to one of the systems shall be identified as a separate CI of that system.
- **Interfaces** Functions that are highly data-dependent or control-dependent of a configuration item should be allocated to that same CI. Each function that exhibits a high disparity between input and output data rates should be allocated to a separate CI.

NEW or MODIFIED DESIGN

- Unique **Items**. Items unique to particular variant of a CI (as opposed to being standard for every piece of equipment or CI), should be considered for identification as a CI.
- **Variants/Types**. Different configurations due to adaptation for each operating system or location shall be identified by types (or variants) within a single CI. They should not be classified as separate CIs. Supplier elements provided by separate suppliers should be separate CIs.

SECURITY

- **Engineering release system**. CI selection shall enable the contractor to release engineering changes at an assembly level that is reportable and that enables verification of change incorporation. Verification of change incorporation shall not be precluded at a lower level assembly.

TECHNICAL COMPLEXITY

- **Size**. CI selection may be made on the basis of keeping it to manageable proportions; however, this criterion should be used only when selection cannot be made on the basis of other criteria.
- **Software/firmware.** Selection of software component CIs is dependent on the system breakdown structure. Any sub-program designated for use in multiple higher-level programs shall be a separate CI. Firmware components required for a computer program shall be designated as separate CIs.
- **Sub-assembly characteristics**. A sub-assembly within a CI should be selected as a CI if it has common installation and deployment requirements, has a change cycle dependent on the CI, or is subject to separate test or formal acceptance activities.
- **Support equipment**. A large amount of support equipment may be allocated to one or more separate CIs.

TECHNICAL RISK

- **Susceptibility to change/Likelihood of modification**. Each item with a high degree o**f anticipated** change after it becomes operational should be allocated to a separate CI.
- **Maintenance data**. When different agencies have responsibility for maintaining parts of an element, the element may be broken into separate CIs even though they are part of the same function.

NOTE: Existing or modified items/COTS that are not developed at VA expense are usually not re-identified as new CIs on new programs. The same consideration applies to commercial off-the-shelf (COTS) hardware or software.